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MANAGEMENT SCIENCE SUPPORT  
FOR THE  
GUIDE TO CAMOUFLAGE  
FOR DEVELOPERS

FINAL REPORT

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COUNTERSURVEILLANCE AND DECEPTION DIVISION  
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## STUDY GIST

### PRINCIPAL FINDINGS

Through the application of management science support techniques, the Guide to Camouflage for Developers was updated and presented in a systematic format to assist in the survivability enhancement of Army equipment. By blending the threat to be countered with the application of camouflage principles and alternatives, the "Guide" provides a series of possible camouflage techniques and describes testing and evaluation procedures.

### MAIN ASSUMPTIONS

Since the publication of the original Guide to Camouflage for AMC Equipment Developers in 1978, significant improvements in target detection have been made leading to the need for greater emphasis on survivability and major changes in countermeasures.

### PRINCIPAL LIMITATIONS

The principal limitation in the camouflage program is the lack of a clear statement of requirement placed on materiel and combat developers.

### SCOPE OF THE EFFORT

The Guide reviews the AMC camouflage program, describes the threat to be countered by application of camouflage principles and techniques, provides a series of possible camouflage techniques, and describes camouflage testing and evaluation procedures.

### OBJECTIVE

The objective of this task was to provide management science support for the update of the Guide to Camouflage to insure that all previously published data is current, the deletion of data which is no longer relevant or accurate, and that the latest and most complete information on systems, threats, countermeasure goals, development, and testing and evaluation is included.

### BASIC APPROACH

To assist combat and materiel developers in understanding the Army camouflage technology program and assist them in fulfilling their respective responsibilities during the development process, the Guide presents a progression of steps to be taken to achieve successful camouflage for materiel in development. Logically, the initial steps involve establishing an adequate description of the developing item/system concept,

its intended operational employment, and whether or not it should be camouflaged. A threat assessment then is required to identify and characterize the enemy reconnaissance, surveillance and target acquisition threats that are of greatest concern to survivability. Based on the threat and the item/system description, a military worth analysis of several levels of camouflage is conducted and initial cost options are determined. These lead to the development of camouflage performance goals for inclusion in draft requirements documents. The next phase in the development of an appropriate camouflage suite for the evolving hardware is to review available techniques and means to achieve the level of camouflage performance necessary to achieve those goals. There camouflage actions must then be incorporated in the development process to ingrain camouflage into the hardware development; i.e., part of the system. Finally, camouflage requirements must be part of the test and evaluation process to insure the performance objectives are met.

### REASON FOR PERFORMING THE STUDY OR ANALYSIS

To provide an updated Guide to Camouflage for both materiel and combat developers to assist them in the understanding and execution of their responsibilities in the development process.

### IMPACT OF THE STUDY

The Guide to Camouflage provides a systematic approach for developers to achieve an integrated camouflage program as part of the development process.

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## FOREWORD

This technical report is submitted to the U.S. Army Belvoir Research, Development and Engineering Center by Wackenhut Advanced Technologies Corporation (WATCO), 10530 Rosehaven Street (Suite 500), Fairfax, VA 22030. The report documents the effort performed under contract DAAK70-88-D-0015, Task 0002, to provide management science support for the update of the Guide to Camouflage for Developers which is presented at Appendix A.

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## INTRODUCTION

### 1.1 BACKGROUND

The Guide to Camouflage for AMC Equipment Developers is an extremely useful document which focuses attention on the need for camouflage, how to obtain and test camouflage, and the division of responsibilities within the Army for its use. Additionally, the Guide highlights Belvoir's capability to provide consultant service as well as system development and installation. Recent changes in the Army's operational environment resulting from new concepts (e.g., AirLand Battle), the introduction of new forces (e.g., Light Infantry Divisions), and new equipment (e.g., MLRS) have created additional needs for camouflage. The growing understanding of the Soviet capabilities to detect and kill targets has led to the realization that camouflage can increase the survivability of weapons systems. These factors have created an increased appreciation of the Guide throughout the Army. This has resulted in requests for copies and for relevant information. This increased interest in and use of the Guide highlight a need to have it updated. Since the publication of the Guide in April 1978, there have been many additions to the Camouflage Critical (CC) and Camouflage Sensitive (CS) listings, significant improvements in target detection, greater emphasis on survivability, major changes in countermeasures, and the addition of new tests and testing facilities.

### 1.2 OBJECTIVES

The objective of this task was to provide management science support for the update of the Guide to Camouflage to insure that all previously published data is current, the deletion of data which is no longer relevant or accurate, and that the latest and most complete information on systems, threats, countermeasure goals, development, and testing and evaluation is included.

### 1.3 PROGRAM ELEMENTS

The following program tasks were performed to achieve the objectives of this program effort:

#### 1.3.1 Task 1 - Analyze Stated and Implied User Requirements

An analysis and data search will be conducted to assist in achieving the following four goals:

- Insure that Army established camouflage requirements are documented.
- Provide an accurate perception of the threat.
- Identify countermeasures; current, near and far term.

- Provide comprehensive lists of tests and test facilities.

To insure that Army established camouflage requirements are documented, DA, AMC, and Belvoir regulations, pamphlets, letters and other publications will be reviewed. The provision of an accurate perspective of the threat and the identification of countermeasures will require a review of both scientific and technical intelligence and technical literature. Of particular interest will be studies conducted by the Army and other services. The cataloging of tests and test facilities will require a review of documents of all services.

#### 1.3.2 Task 2 - Functional Analysis

To insure accomplishment of the program goals, functional analyses will be conducted to supplement the requirements analysis. The functional analyses will be performed and the results coordinated with both government and non-government personnel throughout the development community and with user personnel, TRADOC in particular.

#### 1.3.3 Task 3 - Conduct Evaluations

To establish that data is consistent and representative of actual camouflage systems and concepts.

#### 1.3.4 Task 4 - Provide a Description of Camouflage Techniques

To include functional schematics, engineering drawings, specifications, general physical system descriptions, and support requirements.

#### 1.3.5 Task 5 - Program Management Documentation

Assemble requisite programmatic descriptions of camouflage systems and concepts to describe their schedule and resource requirements necessary to support the RDA process.

#### 1.3.6 Task 6 - Documentation

The basic format of the current Guide will be retained. During the update of the guide, a continuous review will be made to insure correct inclusion of material obtained from both the data search and the conduct of interviews.

### 1.4 SUMMARY OF PROGRAM EFFORT

Two separate volumes were prepared; the main volume consisting of six chapters, and a volume containing six separate appendices.



The objective of the Camouflage Guide is to aid both the Combat Developer and the Materiel Developer to understand, define and incorporate technical aspects of countersurveillance into the requirement for, and the production of, a battlefield hardware item.

The program effort consisted of three phases. In the first phase research was conducted to establish the current state of the art in countersurveillance technology theory and application. In addition the authors developed a thorough understanding of the current Army materiel development process, the currently available applications of countersurveillance, and the inventory of available testing facilities.

In the second phase, the authors developed a model for the Guide which incorporated the findings of the research effort together with an Operations Research/Systems Analysis approach. This approach structured an assessment of the threat faced by a candidate system, a determination of which systems needed camouflage, and an assessment of the military worth of camouflage application.

In the third phase, the authors drafted and prepared the ready-to-be-published final copies of the two volumes. A ten-step process was developed and defined in the first volume. The process carried the candidate system from assessment of need for camouflage, through an evaluation of threat capability to detect it, to proposals to defeat the threat, on to analyses of the worth of the proposals and selection of the applicable technique, ending with test and evaluation of the performance of the camouflaged system. The second volume contained more explicit and more technical explanations, plus a library of available techniques and test facilities. The final product was assembled with color pictures, charts and diagrams to encourage and retain the interest of the development community in this vital subject.

## APPENDIX A

### A GUIDE TO CAMOUFLAGE FOR DEVELOPERS